Pre-Calculus Honors

Sum and Difference Identities

Find the exact value of each.

1) $\cos 105$

2) $\cos \dfrac{5\pi}{12}$

3) $\sin 15$

4) $\sin \dfrac{19\pi}{12}$

5) $\cos 165$

6) $\tan \dfrac{7\pi}{12}$

7) $\tan 255$

8) $\sin \dfrac{5\pi}{12}$

9) $\sin 195$

10) $\tan \dfrac{\pi}{12}$

Simplify.

11) $\dfrac{\tan 6\theta + \tan -\theta}{1 - \tan 6\theta \tan -\theta}$

12) $\cos 5\theta \cos 3\theta + \sin 5\theta \sin 3\theta$

13) $\cos -4\theta \cos -5\theta + \sin -4\theta \sin -5\theta$

14) $\dfrac{\tan -5u - \tan -u}{1 + \tan -5u \tan -u}$

Verify each identity.

15) $\tan (45 + \theta) = \dfrac{1 + \tan \theta}{1 - \tan \theta}$

16) $\sin (\theta + 90) = \cos \theta$

17) $\sin (\pi + \theta) = -\sin \theta$

18) $\tan (\theta - 135) = \dfrac{\tan \theta + 1}{1 - \tan \theta}$

Answers to Sum and Difference Identities

1) $\dfrac{\sqrt{2} - \sqrt{6}}{4}$

2) $\dfrac{\sqrt{6} - \sqrt{2}}{4}$

3) $\dfrac{\sqrt{6} - \sqrt{2}}{4}$

4) $\dfrac{-\sqrt{6} - \sqrt{2}}{4}$

5) $\dfrac{-\sqrt{6} - \sqrt{2}}{4}$

6) $-2 - \sqrt{3}$

7) $2 + \sqrt{3}$

8) $\dfrac{\sqrt{6} + \sqrt{2}}{4}$

9) $\dfrac{\sqrt{2} - \sqrt{6}}{4}$

10) $2 - \sqrt{3}$

11) $\tan 5\theta$

12) $\cos 2\theta$

13) $\cos \theta$

14) $\tan -4u$

15) $\tan (45 + \theta)$
$$= \frac{\tan 45 + \tan \theta}{1 - \tan 45 \tan \theta}$$
$$= \frac{1 + \tan \theta}{1 - \tan \theta}$$
$$= \frac{1 + \tan \theta}{1 - \tan \theta}$$

16) $\sin (\theta + 90)$
$= \sin \theta \cos 90 + \cos \theta \sin 90$
$= \sin \theta \cdot 0 + \cos \theta \cdot 1$
$= \cos \theta$

17) $\sin (\pi + \theta)$
$= \sin \pi \cos \theta + \cos \pi \sin \theta$
$= 0\cos \theta - \sin \theta$
$= -\sin \theta$

18) $\tan (\theta - 135)$
$$= \frac{\tan \theta - \tan 135}{1 + \tan \theta \tan 135}$$
$$= \frac{\tan \theta - -1}{1 + \tan \theta \cdot -1}$$
$$= \frac{\tan \theta + 1}{1 - \tan \theta}$$